

Large-scale two-particle p_t correlations from inverted $\langle p_t \rangle$ fluctuation scale dependence observed in Au-Au collisions at $\sqrt{s_{NN}} = 200$ GeV

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Abstract:

We report measurements of large-scale, charge-independent two-particle p_t correlations on axial momentum components (η, ϕ) inferred from event-wise (p_t) fluctuation scaling with $p_t < 2$ GeV/c in 200 GeV Au-Au collisions. Recently-observed nonstatistical (p_t) fluctuations can be attributed to event-wise and/or intra-event variation of a sampled inclusive parent p_t distribution. Variation of excess (p_t) fluctuations with binning scale (bin sizes $\delta\eta, \delta\phi$) are simply related to the integral of a two-particle autocorrelation distribution which can be numerically inverted to obtain the autocorrelation. From fluctuation scaling measurements we thus obtain p_t autocorrelations on joint difference variables ($\eta_\Delta \otimes \phi_\Delta$) (e.g., $\eta_\Delta \equiv \eta_1 - \eta_2$).

By analogy with inclusive one-dimensional p_t distributions we expect the structure of such p_t autocorrelations to be determined by a combination of temperature and velocity (e.g., collective flow) two-point correlations on hadronic and prehadronic media. We indeed observe highly structured autocorrelation distributions, minijets being a possible contributing mechanism. We find that with increasing centrality the away-side peak structure is dramatically reduced, while the same-side peak is narrowed on ϕ_Δ and broadened on η_Δ , suggesting substantial alteration of minijet structure by a dissipative medium. Those p_t correlations may provide, through correlation structure of low- p_t hadrons, quantitative new information about response of the medium to minijets as color probes.

